ISSN (print) 0093-4666 © 2015. Mycotaxon, Ltd. ISSN (online) 2154-8889

MYCOTAXON

http://dx.doi.org/10.5248/130.1185

Volume 130, pp. 1185–1189 *October–December 2015*

Phoma candelariellae sp. nov., a lichenicolous fungus from Turkey

Zekiye Kocakaya[1], Mehmet Gökhan Halici[2*] & Mustafa Kocakaya[1]

[1] *Department of Organic Agriculture, Boğazlıyan Vocational School, University of Bozok, 66400, Yozgat, Turkey*

[2] *University of Erciyes, Faculty of Science, Department of Biology, 38039, Kayseri, Turkey*

* Correspondence to: *mghalici@gmail.com*

Abstract — *Phoma candelariellae* is described from the apothecia of *Candelariella aurella* in the Central Anatolia region of Turkey. The new species is distinguished among the lichenicolous *Phoma* species by its clustered conidiomata arising in groups and its subglobose conidia. It is also the first *Phoma* species reported on *Candelariella*.

Key words — biodiversity, coelomycetes, mitosporic fungi, *Phaeosphaeriaceae*, *Dothideomycetes*

Introduction

Phoma Sacc. is a large fungus genus with approximately 220 species, most of which are plant pathogens, endophytes, or saprophytes (Boerema et al. 2004). Twenty-four species in this genus, however, are obligately lichenicolous (Hawksworth 1981, Hawksworth & Cole 2004, Diederich et al. 2007, Brackel 2008, Kondratyuk et al. 2010, Lawrey et al. 2012, Halıcı et al. 2014). Keys to lichenicolous *Phoma* species have been provided by Hawksworth (1981), Hawksworth & Cole (2004), and Diederich et al. (2007). Recent molecular analyses place the genus in the *Phaeosphaeriaceae*, *Pleosporales*, *Dothideomycetes* (Lawrey et al. 2012).

Halıcı (2008) published a key to the lichenicolous fungi of Turkey covering 117 taxa. Of the 190 lichenicolous species reported from Turkey (Halıcı et al. 2012, 2014), only three lichenicolous *Phoma* species have been reported: *P. peltigerae* (P. Karst.) D. Hawksw. on *Peltigera* spp. (Candan et al. 2010; Halıcı et al. 2012); *P. caloplacae* D. Hawksw. [≡ *Diederichomyces caloplacae*; Trakunyingcharoen et al. 2014] on the apothecia of *Caloplaca stillicidiorum* (Hawksworth 1981); and *P. recepii* Halıcı & Candan on the apothecia of *Caloplaca cerina* and *C. monacensis*

(Halıcı et al. 2014). A new species, described here as *P. candelariellae*, represents the fourth lichenicolous *Phoma* species from Turkey.

Material & methods

The holotype and paratype specimens of the new species are deposited in Erciyes University Herbarium Kayseri, Turkey (ERC). Sections were prepared by hand and examined in I [Lugol's iodine (Merck 9261) with (KI) and without (I) pre-treatment with 10% KOH], 10% KOH, cotton blue, and water. Conidia and pycnidia were measured in water; measurements are presented as (min–) X–sd – *X* – X+sd (–max), where 'min' and 'max' represent the extreme values, 'X' the arithmetic mean, and 'sd' the standard deviation. The microphotographs were taken with a Leica DFC 420 digital microscope camera with a c-mount interface and a 5 megapixel CCD.

Taxonomy

Phoma candelariellae Z. Kocakaya & Halıcı, **sp. nov.** Figure 1

MycoBank MB 812271

Differs from all other lichenicolous *Phoma* species by its combination of clustered conidiomata arising in groups, subglobose conidia, and host genus *Candelariella*.

Type: Turkey, Eskişehir, Sivrihisar, northwest of Sivrihisar, 39°27′16″N 31°31′36″E, alt. 1260 m, on apothecia of *Candelariella aurella* (Hoffm.) Zahlbr., 22 July 2012, M.G. Halıcı MGH3.274 (**Holotype,** EUH).

Etymology: The epithet refers to the host lichen genus *Candelariella*.

Conidiomata pycnidial, arising in groups on the apothecia of the host lichen (*Candelariella aurella*), at first more or less immersed but at maturity becoming partially erumpent, clustered, black in macroscopic view, in section pale golden brown in lower parts and dark brown in the upper parts, covered by a hyaline gelatinous sheath, subglobose to almost globose, (72–)80–*98.5*–117(–129) × (69–)74–*89*–103(–111) µm (n = 20), ostiolate, ostiole c. 12 µm diam.; pycnidial wall 9–14 µm thick, composed of 2–5 layers of pseudoparenchymatous cells, mainly polyhedral but some globose, outer cells dark brown, about 4–6 × 6–7 µm, inner ones paler, 4–7 µm wide. Cells near the ostiole have a darker brownish tinge. Conidiogenous cells lining the inner wall of the pycnidial cavity, short ampulliform to subglobose, hyaline, smooth-walled, 4–7 × 3–5 µm, conidiogenesis enteroblastic. Conidia abundantly produced, arising singly, subglobose to globose, hyaline, generally 1-guttulate, sometimes one additional small guttule present, simple, smooth-walled, with a gelatinous sheath, (3.5–)4.5–*5*–5.5(–6) × (3–)3.5–*3.9*–4.5(–5.4) µm; l/b = (0.9–)1.1–*1.3*–1.5(–1.7) (n = 100).

Additional specimen examined: **TURKEY**, **Kütahya**, Ilıca, north of Yazlıca Village, 39°36′41″N 30°03′03″E, alt. 1050 m, on apothecia of *Candelariella aurella*, 29 June 2012, M.G. Halıcı MGH3.331 (EUH).

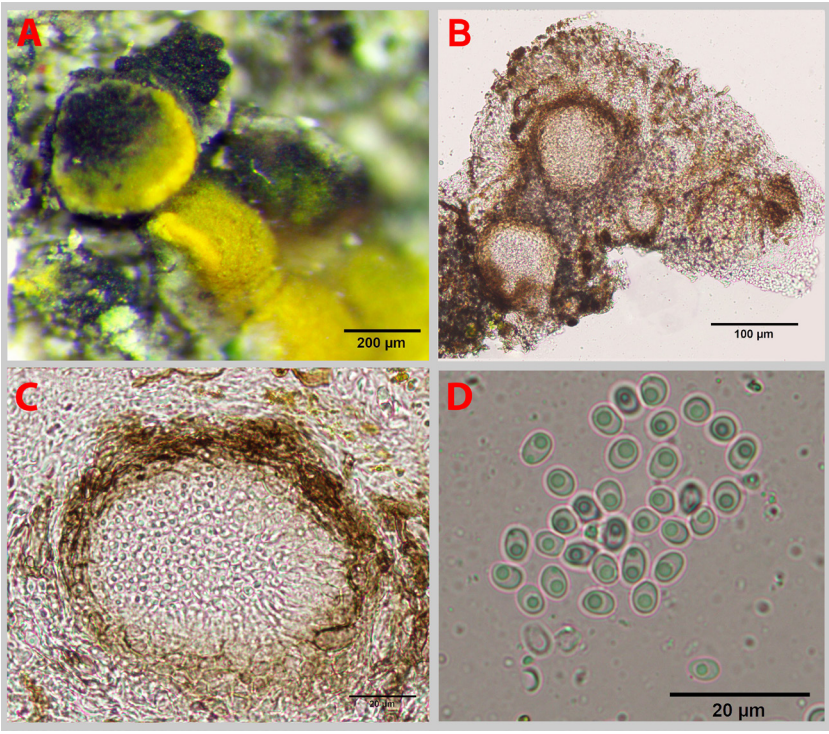

Fig. 1. *Phoma candelariellae* (holotype, ERC MGH 3.274): A, infected apothecial discs of the host lichen, *Candelariella aurella*, showing conidiomata arising in groups; B, conidiomata in the hymenium of the host; C, closer view of a conidioma; D, conidia.

Ecology & distribution: *Phoma candelariellae* is currently known from only two localities in the northwest part of the Central Anatolia Region, Turkey, on the apothecia of *Candelariella aurella* on calcareous rocks at an 1000–1300 m elevation. As the host lichen occurs on calcareous rocks throughout the northern hemisphere, *P. candelariellae* may have a potentially much wider distribution. The species seems to be pathogenic, as the infected apothecial discs of the host discolour and become blackish; ascospore production is apparently inhibited in the infected parts of the hymenium, until eventually the entire hymenium of an infected apothecium is destroyed.

Notes: *Phoma candelariellae* is the only *Phoma* species known to grow on *Candelariella*. Among the previously described lichenicolous *Phoma* species, only *P. caloplacae*, *P. lobariae* Diederich & Etayo, *P. puncteliae* Diederich

Table 1. Comparison of lichenicolous *Phoma* species with subglobose conidia

Species	Conidiomata (µm)	Conidiogenous cells (µm)	Conidia (µm)	Reference
P. caloplacae	50–130	5–6	4–7	Hawksworth (1981)
P. candelariellae	72–129 × 69–111	4–7 × 3–5	3.5–6 × 3–5.4	This paper
P. lobariae	50–100	4–6 × 1.7–3.5	3–4 × 2.5–3	Etayo & Diederich (1995)
P. physciicola	100–150	4–7	4–6 × 2.5–4	Hawksworth (1981)
P. puncteliae	40–60	2.5–5 × 3.5–4.5	2.5–3 × 2–2.4	Lawrey et al. (2012)

& Lawrey [≡ *Xenophoma puncteliae*; Trakunyingcharoen et al. 2014], and *P. physciicola* Keissl. have subglobose conidia. These species all grow on different lichen hosts and differ from *P. candelariellae* in various morphological characters (Table 1). *Phoma caloplacae* differs from *P. candelariellae* by its conidiomata arising singly in the host apothecia and its slightly larger conidia (Hawksworth 1981, Halıcı et al. 2014). *Phoma lobariae*, described on the older parts of the thallus of *Lobaria pulmonaria*, also has conidiomata arising singly and slightly smaller conidia and conidiomata (Etayo & Diederich 1995). *Phoma physciicola*, reported on *Physciaceae*, *Parmeliaceae*, and *Baeomyces rufus*, produces conidiomata that sometimes arise in small groups on the apothecia or thalli of the host lichens but is distinguished by its more ellipsoid conidia (Keissler 1911, Hawksworth 1981, Diederich et al. 2007). *Phoma puncteliae*, growing on the thalli of *Punctelia rudecta*, has obviously smaller conidia and conidiomata (Lawrey et al. 2012).

Acknowledgements

The manuscript was reviewed by Kerry Knudsen (USA and Czech Republic) and Wolfgang von Brackel (Germany). This study was financially supported by FDK-2014-5259 coded Erciyes University project. The samples were collected during the project supported by Tübitak (111T927 coded project).

Literature cited

Boerema GH, Gruyter J de, Noordeloos ME, Hamers MEC. 2004. *Phoma* identification manual. Differentiation of specific and infra-specific taxa in culture. CABI Publishing, Wallingford, UK. http://dx.doi.org/10.1079/9780851997438.0000

Brackel W von. 2008. *Phoma ficuzzae* sp. nov. and some other lichenicolous fungi from Sicily, Italy. Sauteria 15: 103–120.

Candan M, Halıcı MG, Özdemir Türk A. 2010. New records of peltigericolous fungi from Turkey. Mycotaxon 111: 149–153. http://dx.doi.org/10.5248/111.149

Diederich P, Kocourková J, Etayo J, Zhurbenko M. 2007. The lichenicolous *Phoma* species (coelomycetes) on *Cladonia*. Lichenologist 39: 153–163. http://dx.doi.org/10.1017/S0024282907006044

Etayo J, Diederich P. 1995. Lichenicolous fungi from the western Pyrenees, France and Spain I. New species of deuteromycetes. 205–221, in: FJA Daniels et al. (eds). Flechten Follmann: contributions to lichenology in honour of Gerhard Follmann. Cologne.

Halıcı MG. 2008. A key to the lichenicolous *Ascomycota* (including mitosporic fungi) of Turkey. Mycotaxon 104: 253–286.

Halıcı MG, Candan M, Özdemir Türk A. 2012. A key to the peltigericolous fungi in Turkey. Mycotaxon 119: 277–289. http://dx.doi.org/10.5248/119.277

Halıcı MG, Candan M, Güllü M, Özcan A. 2014. *Phoma recepii* sp. nov. from the *Caloplaca cerina* group in Turkey. Mycotaxon 129(1): 163–168. http://dx.doi.org/10.5248/129.163

Hawksworth DL. 1981. The lichenicolous coelomycetes. Bulletin of the British Museum (Natural History), Botany 9. 98 p.

Hawksworth DL, Cole MS. 2004. *Phoma fuliginosa* sp. nov., from *Caloplaca trachyphylla* in Nebraska, with a key to the known lichenicolous species. Lichenologist 36: 7–13. http://dx.doi.org/10.1017/S0024282904013982

Keissler K von. 1911. Zwei neue Flechtenparasiten aus Steiermark. Hedwigia 50: 294–298.

Kondratyuk S, Kärnefelt I, Goward T, Galloway D, Kudratov I, Lackovičova A, Lisická E, Guttová A. 2010. Diagnoses of new taxa. 435–445, in: AM Oksner (ed.). Flora lišaynikiv Ukraini y dvoch tomach, Tom 2, Vypusk 3. Kiiv, Naukovo Dumka.

Lawrey JD, Diederich P, Nelsen MP, Freebury C, Van den Broeck D, Sikaroodi M, Ertz D. 2012. Phylogenetic placement of lichenicolous *Phoma* species in the *Phaeosphaeriaceae* (*Pleosporales*, *Dothideomycetes*). Fungal Diversity 55: 195–213. http://dx.doi.org/10.1007/s13225-012-0166-9

Trakunyingcharoen T, Lombard L, Groenewald JZ, Cheewangkoon R, To-anun C, Alfenas AC, Crous PW. 2014. Mycoparasitic species of *Sphaerellopsis*, and allied lichenicolous and other genera. IMA Fungus. 5(2): 391–414. http://dx.doi.org/10.5598/imafungus.2014.05.02.05